# Stretching Our Nation's Timber Supply

## Close Timber Utilization

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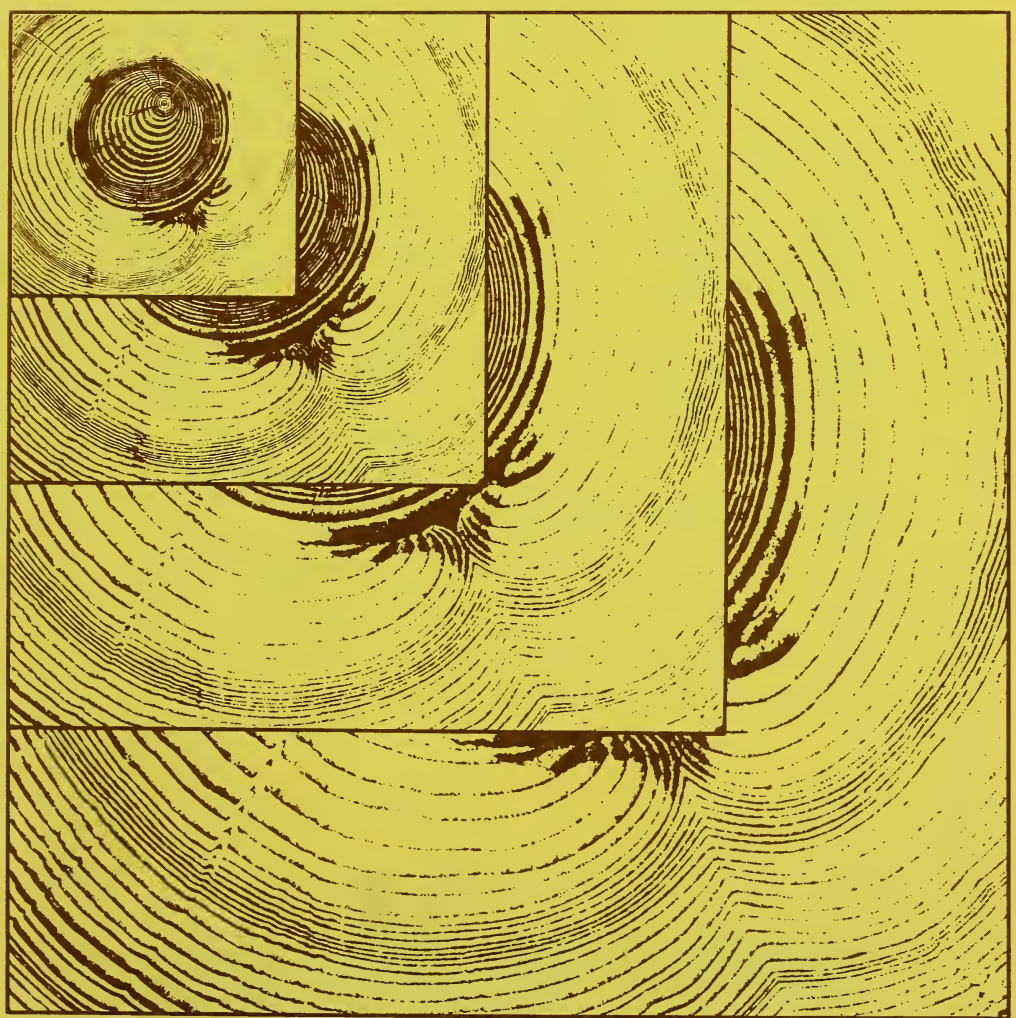

# STRETCHING OUR NATION'S TIMBER SUPPLY

## Close Timber Utilization

by

H. E. Wahlgren, Roland Barger, and Harold Marx[1]

A major challenge facing American forestry today is the need to achieve more complete and efficient use of our available wood resource. The term *Close Timber Utilization* (CTU) has been adopted to represent the concerted efforts of the Forest Service to improve utilization. Close Timber Utilization simply means "stretching our Nation's timber supply to meet growing demands," and doing so in a manner consistent with responsible management of the forest ecosystem.

Demand for lumber and wood products is increasing steadily, with the predicted worldwide market for wood expected to double by the year 2000. To furnish this huge wood-products mix, forest industries of the United States will require more than 250 million tons of raw wood annually (approximately 22 billion cubic feet—that is roughly equal to the combined production of all metals, cement, and plastics.)

At the same time, however, we are experiencing conflicting forest land uses that are reducing the land area available for commercial timber production. Commercial forest lands of all ownerships are being withdrawn from timber production by urban development, second-home sites, highways, power lines, and other nontimber uses. Rising public concern for forest esthetics and environmental quality places critical constraints on timber harvesting activities.

More than ever, attention is sharply focused on the need to achieve more complete and efficient utilization of our available timber resource. Further, we need to do so in a manner that is consistent with total forest management objectives, and in a manner that is compatible with environmental and biological constraints.

Wood residues and extensive volumes of dead timber are also creating significant resource management problems. Better utilization of this unused wood material can substantially extend the wood-fiber resource and can contribute to resolving some of the more difficult environmental and management problems associated with timber harvesting. The CTU program is directed specifically toward these objectives, with emphasis on recovering and using more of the material that currently remains in the forest as residue.

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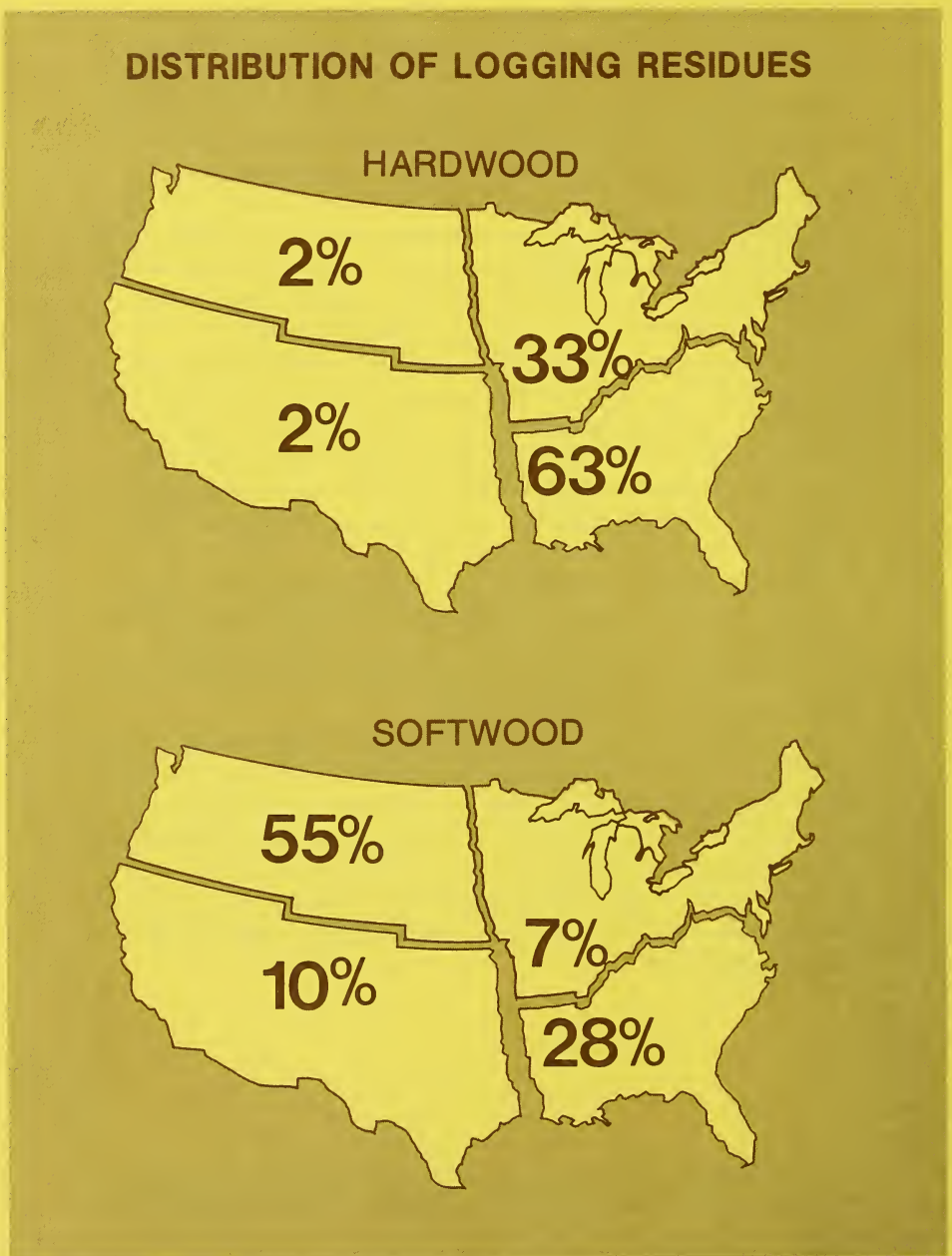
## UNUTILIZED RESOURCE

This unutilized resource includes all available wood material that for one reason or another remains in the forest—

- Logging slash—including tops, limbs, stumps, and cull logs
- Dead material standing and down—including fire, insect- and disease-killed timber
- Small trees cut in the process of logging, right-of-way clearing, or thinning.



Nationally it is estimated that some 9.6 billion cubic feet of wood residues are left in the commercial forest each year. This includes:

| | (Cubic feet) |
|---|---|
| Fire, disease, insect mortality | 4.5 billion |
| Logging slash—tops, limbs, cull | 3.6 billion |
| Land clearing, changes in land use, and thinning | 1.5 billion |
| Total | 9.6 billion (approximately 150 million tons) |

Not all of this material is usable—some is decayed, some is on inaccessible areas. Some of it is being used in salvage operations of various types. But not enough of it is being used.

We estimate that 6 of the 9.6 billion cubic feet of residues left in the forest each year could be made into usable products. Obviously, this would ease the timber shortage, with all the additional benefits this implies!

The nature of this resource varies significantly from one region to another. For example, logged areas in West Coast Douglas-fir may typically have 3,000 cubic feet ( 45 tons) or more per acre of large, unused material remaining on the site. In the Intermountain area the most conspicuous residue component is dead timber.

In addition to the 9.6 billion cubic feet previously mentioned, there is a huge backlog of salvable dead material that has been accumulating for many years.

About 7 billion cubic feet (100 million tons) of usable dead sawtimber exist within the nine Rocky Mountain States. In the eastern half of the United States, harvesting operations leave some 2 billion cubic feet (30 million tons) of wood material in standing trees, predominantly undesirable hardwood species growing on sites that could be producing valuable softwoods.

In addition to simply recovering and using more of this available wood resource, renewed attention must be given to the various influences of timber harvesting upon the forest ecosystem. Land management practices are under increasing scrutiny, and the manner in which timber is harvested is perhaps the single most drastic management activity that we undertake.

## IMPLEMENTATION OF CTU

Alternative harvesting practices and utilization standards—especially CTU—have significant and far-reaching effects upon the entire forest ecosystem, ranging from forest microbiology to esthetic quality. They also influence postharvest management options, activities, and associated costs. Finally, timber harvesting (including CTU) must be recog-

nized as a management tool, facilitating the management of an area for a broad range of objectives beyond the immediate harvest of wood fiber. Objectives include such considerations as wildlife habitat, fire hazard reduction, watershed values, and esthetic quality.

The CTU effort is directed toward more complete and efficient use of our national timber resource. This involves a coordinated effort of National Forests, State and Private Forestry units, and Research units.

National Forest managers are developing techniques and procedures for improving CTU in conjunction with timber harvesting activities on National Forest lands. CTU is being implemented by changes in timber sale procedures to provide for improved utilization. These include:

- Revision of regional utilization standards reducing minimum size and quality specifications for material removed. This may include the removal of dead and other cull material. Every attempt is made to encourage economical removal of additional material below the minimum utilization standards. For example, in one western region the minimum merchantable sawlog top diameter is now 5½ inches. Under favorable market conditions, however, some mills are removing and using material as small as 2½ inches in diameter. In the Eastern United States, utilization standards have been reduced to 4 inches for conifers and 10 inches for hardwoods.
- Increased use of tree measurement or lump-sum timber sales contracts. Such sales arrangements can result in better utilization than under a direct stumpage charge, because the purchaser, having paid a lump-sum price for the timber, normally will try to maximize his volume recovery.
- Required Yarding of Unutilized Material, commonly referred to as "YUM." This yarding practice is particularly applicable to decayed old-growth timber stands. The yarding cost for such material is borne by the sale as a whole, and the purchaser needs only to cover loading and hauling costs if he chooses to process some of the yarded material.
- Application of timber appraisal procedures in which multiple pricing is applied according to quality of the material. This can be based on either the available volume or the acreage to be harvested. For example, in the Western United States, smaller and lower quality material may be priced at a fixed dollar amount per acre—Per Acre Measurement (PAM).
- Multistage logging, whereby a prelogging operation is included to recover material that would otherwise be damaged by the logging activity, or postlogging to recover material that remains as residue following logging.
- Salvage rights as part of service contracts that involve cutting trees. For example, this is frequently a part of thinning contracts and contracts to remove insect-infested trees.

CTU also addresses itself to the problems of harvesting wood more efficiently under various environmental and management constraints. Steep slopes, wetlands, fragile soils, and esthetically sensitive areas are

examples of situations that require special care. Extended application of aerial and cable harvesting systems is being required where access, construction of new roads, or soil conditions are major constraints. For example, balloon and helicopter yarding, and use of skyline systems are utilized in situations where the timber could not otherwise be harvested.

Where accessibility and terrain are favorable, industry has been encouraged to use harvesting systems that employ whole tree-handling techniques and in-woods processing. A typical system may include use of feller-bunchers, grapple skidders, and in-woods breakdown of whole stems at the landing. Material unsuited to log products may be chipped at the site.

Additional timber harvesting practices that insure more complete utilization include minimum bucking in the forest and final breakdown at the mill or at an intermediate processing site.

State and Private Forestry (S&PF), in its traditional role of cooperation with State forestry agencies and private forest interests, is working to implement CTU techniques and procedures on State and private lands and in timber harvesting and processing operations. An example of this effort is S&PF's role in establishing improved falling and bucking practices. Analysis of practices currently employed by cooperating loggers leads to technical assistance and training to reduce volume and value losses in the woods. Through market analyses, field demonstrations, and workshops, S&PF is working to promote multiproduct harvesting procedures that direct roundwood to its highest value use.

The Sawmill Improvement Program (SIP) is another example of CTU implementation by State and Private Forestry. The payoff is high in terms of improved lumber recovery. SIP has helped mill operators tighten quality control and utilize new equipment developments, such as computer-controlled sawing operations, to capture the volume increases that are possible.

## RESEARCH

Forest Service research units across the country are developing new technology and improved methods and procedures that can be used to harvest, handle, and process the wood resource more efficiently and economically. Research on forest residues will enable us to utilize more of the wood material that previously was left after harvest.

Inventory studies in a number of locations are improving our estimate of the volume, location, and character of the residue resource. Companion studies are evaluating product potential and applicability of standard processing practices.

Because residue and salvage material often have significantly different physical characteristics, new processing techniques and guidelines must be developed. Drying, machining, treating procedures, methods, and schedules are being developed for products manufactured from dead timber. Pulping processes and particleboard manufacturing processes that can utilize smaller, low-grade hardwood material are being investigated. Bark-chip separation methods that have been developed allow production of "clean" chips from the bark-wood mixture obtained in field-chipping residues.

At the national Forest Products Laboratory, Project STRETCH includes a number of coordinated research efforts—all directed toward extending the national timber supply through increased yield of lumber-type products. Specific efforts include:

- Development of Best Opening Face (BOF), an automated, computerized system for maximizing recovery from logs processed through a sawmill. The BOF system automatically solves the geo-

metric problem of obtaining maximum lumber volume from logs shaped like a tapered cylinder.

- Development of an automated system of defect detection in lumber, particularly useful as part of an industrial processing control system for smaller, lower grade material.
- Development of systems for producing superior lumber products from thick, rotary-cut veneer (Press-Lam), and from end-and-end glued panels made up of irregularly sized sawn material—Edge, Glue, and Rip (EGAR).

Other research is evaluating pulping methods and processes that can facilitate use of "rough" wood—that is, wood chips containing bark and perhaps some twig and foliage material. Still other research is evaluating the potential contribution of wood residues to national energy and chemical needs. Included are:

- Development of techniques for direct conversion of wood residues to energy.
- Development of techniques for conversion of wood residues into petrochemical substitutes and other industrially important chemicals.

A national Forest Service research and development effort is presently underway to develop a new class of products—structural flakeboards—from residue material. Virtually any forest residue large enough to convert to flakes can be used to produce structural flakeboards. They are being designed to meet many of the structural panel needs that currently require either lumber or plywood.

At a number of field Forest Service research units, accelerated research is underway to develop improved systems for harvesting, handling, and transporting residue material, and to develop improved timber resource management alternatives and strategies. From the forest land management point of view, there are two immediate and related needs—(1) to improve recovery and use of residue and salvage wood material, and (2) to define and understand the ecological and economic consequences of more intensive utilization.

Research in harvesting methods and systems is evaluating the capability of existing systems—perhaps with some modification—to recover efficiently more of the material that would otherwise remain as residue. Additional research is developing new harvesting practices and equipment better suited to smaller, lower value material. Investigations of new systems are concentrated on smaller, less expensive cable systems, and on systems that can harvest and preprocess whole stems more efficiently.

Other research is making use of operations analysis procedures and computer technology to develop improved techniques for timber sale layout, and for optimization of harvesting systems and activities. Such developments can improve the efficiency of planned harvesting operations, and thereby facilitate removal of material that would otherwise be uneconomical to recover.

The manner in which timber is harvested significantly influences almost all aspects of the forest ecosystem—microclimate, nutrient avail-

ability, microbiology, insect and disease activity, hydrology, fuels, and esthetic quality. More intensive levels of utilization, in which residues are removed, may have both beneficial and detrimental effects upon subsequent management of the site and regeneration of a new stand. Ongoing research is investigating these effects, and will provide the forest manager with the information needed to prescribe intensive harvesting operations compatible with environmental and management objectives.

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## UNUTILIZED RESOURCE

LOGGING SLASH

FIRE DAMAGED TREES, INSECT- AND DISEASE-KILLED TIMBER

SMALL TREES

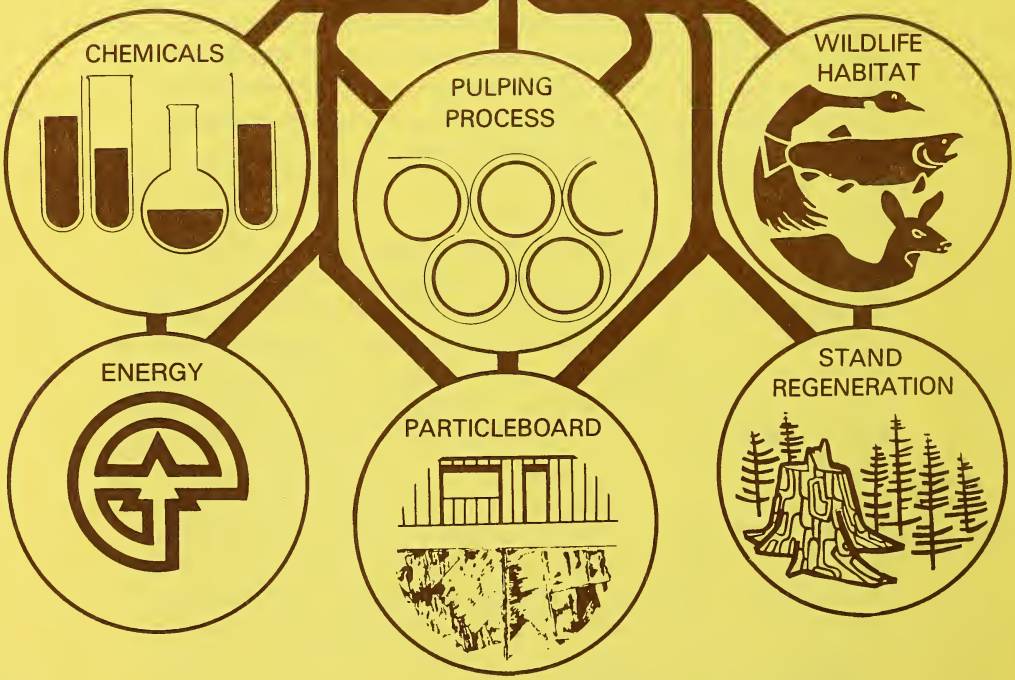
RESEARCH

UTILIZATION

CHEMICALS

PULPING PROCESS

WILDLIFE HABITAT



ENERGY

PARTICLEBOARD

STAND REGENERATION

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Studies of the environmental and management influences of intensive utilization include:

- Effects on microclimate
- Effects on micrometeorological sites
- Effects on understory vegetation development
- Influence on wildlife habitat
- Influence on soil chemistry and nutrient cycling and translocation
- Forest insect activity and dispersion
- Onsite hydrologic effects
- Natural seeding and subsequent stand regeneration and development
- Fuel loading and character associated with remaining residues
- Site treatment required following harvesting
- Influence on forest microbiology, including N-fixation, mycorrhizae formation, decay, and pathogen activity
- Evaluation of the total costs and benefits—both immediate and longer range—associated with alternative harvesting and utilization practices.

Research is also being directed toward evaluating the industrial feasibility of establishing new industry based on residue utilization. Although the ultimate decision must depend upon analysis by industry, preliminary research can define the wood resource, determine the availability of other necessary resources, evaluate regional and national market and price trends, and provide a basis for judging between alternative locations.

## SUMMARY

The CTU program addresses two critical national needs—(1) improving utilization of our timber resources to meet growing demands for wood and wood-based products, and (2) reducing the volume of residues and salvage timber that are creating significant cost and management problems on National Forest lands. Through the concerted efforts of Forest Service land managers, specialists, and researchers, more intensive utilization of this potential resource is being fostered. Improved practices and incentives for further improvement are being put into action on ongoing timber sales. Research is developing new systems, methods, and techniques that can be implemented to realize added product and value recovery from the wood resource.

Wood is a unique, renewable resource that can satisfy the material as well as esthetic needs of the Nation. Through CTU, both objectives can be met in a technically efficient, environmentally acceptable manner.

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